

Attorney Docket No. 9233-54

Application Serial No.: 09/873,899

Filed: June 4, 2001

Page 2

The list of claims will replace all prior versions and listings of claims in the application. Applicants note, however, that the only change from the listing of claims presented in the Amendment After Final submitted on March 11, 2004 is the addition of new claims 117-122. For clarification, claims noted in the previous amendment as "currently amended" are listed herein as "currently amended" with the markings to show the change made, and claims previously listed as "new" as listed herein as "new."

Listing of Claims:

1-15. (Canceled)

16. (Previously Presented) A mixture of conjugates, each comprising human insulin coupled to an oligomer that comprises a polyethylene glycol moiety, wherein the mixture has a dispersity coefficient (DC) greater than 10,000, where

$$DC = \frac{\left(\sum_{i=1}^n N_i M_i \right)^2}{\sum_{i=1}^n N_i M_i^2 \sum_{i=1}^n N_i - \left(\sum_{i=1}^n N_i M_i \right)^2}$$

wherein:

n is the number of different molecules in the sample;

 N_i is the number of i^{th} molecules in the sample; and M_i is the mass of the i^{th} molecule; and

wherein the conjugate comprises a first oligomer and a second oligomer; and

wherein the first oligomer is covalently coupled at Lys^{B29} of the insulin and the second oligomer is covalently coupled at N-terminal A1 or N-terminal B1 of the insulin.

17. (Canceled)

18. (Previously Presented) The mixture according to Claim 16, wherein the insulin is covalently coupled to at least one of the oligomers by a hydrolyzable bond.

19. (Previously Presented) The mixture according to Claim 16, wherein the insulin is covalently coupled to the polyethylene glycol moiety of at least one of the oligomers.

Attorney Docket No. 9233-54
 Application Serial No.: 09/873,899
 Filed: June 4, 2001
 Page 3

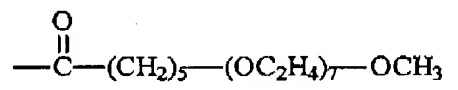
20. (Previously Presented) The mixture according to Claim 16, wherein at least one of the oligomers comprises a lipophilic moiety covalently coupled to the polyethylene glycol moiety.

21. (Previously Presented) The mixture according to Claim 16, wherein at least one of the oligomers comprises a lipophilic moiety.

22. (Previously Presented) The mixture according to Claim 21, wherein the insulin is covalently coupled to the lipophilic moiety.

23. (Previously Presented) The mixture according to Claim 21, wherein the polyethylene glycol moiety is covalently coupled to the lipophilic moiety.

24. (Currently Amended) A mixture of conjugates, each comprising an insulin drug coupled to an oligomer having a formula:



wherein the mixture has a dispersity coefficient (DC) greater than 10,000, where

$$DC = \frac{\left(\sum_{i=1}^n N_i M_i \right)^2}{\sum_{i=1}^n N_i M_i^2 \sum_{i=1}^n N_i - \left(\sum_{i=1}^n N_i M_i \right)^2}$$

wherein:

n is the number of different molecules in the sample;

N_i is the number of ith molecules in the sample;

M_i is the mass of the ith molecule; and

The mixture according to Claim 1, wherein the conjugate comprises a first oligomer and a second oligomer.

Attorney Docket No. 9233-54
Application Serial No.: 09/873,899
Filed: June 4, 2001
Page 4

25. (Previously Presented) The mixture according to Claim 16, wherein the first and the second oligomers are the same.

26. (Previously Presented) The mixture according to Claim 16, wherein at least one of the oligomers comprises a first polyethylene glycol moiety covalently coupled to the insulin by a non-hydrolyzable bond and a second polyethylene glycol moiety covalently coupled to the first polyethylene glycol moiety by a hydrolyzable bond.

27. (Previously Presented) The mixture according to Claim 26, wherein the oligomer(s) comprising a first polyethylene glycol moiety covalently coupled to the insulin by a non-hydrolyzable bond and a second polyethylene glycol moiety covalently coupled to the first polyethylene glycol moiety by a hydrolyzable bond further comprise a lipophilic moiety covalently coupled to the second polyethylene glycol moiety.

28. (Previously Presented) The mixture according to Claim 16, wherein each of the conjugates is amphiphilically balanced such that each conjugate is aqueously soluble and able to penetrate biological membranes.

29-67. (Canceled)

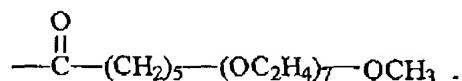
68. (Previously Presented) The mixture according to claim 16, wherein at least one of the oligomers comprises a polyethylene glycol moiety having at least 2 polyethylene glycol subunits.

69. (Previously Presented) The mixture according to claim 16, wherein at least one of the oligomers comprises a polyethylene glycol moiety having at least 5 polyethylene glycol subunits.

70. (Previously Presented) The mixture according to claim 16, wherein at least one of the oligomers comprises a polyethylene glycol moiety having at least 7 polyethylene glycol subunits.

Attorney Docket No. 9233-54
Application Serial No.: 09/873,899
Filed: June 4, 2001
Page 5

71. (Previously Presented) The mixture according to claim 16, wherein the first oligomer has the formula:



72-78. (Canceled)

79. (Previously Presented) A substantially monodispersed mixture of conjugates, each comprising human insulin coupled to an oligomer that comprises a polyethylene glycol moiety,

wherein the conjugate comprises a first oligomer and a second oligomer; and
wherein the first oligomer is covalently coupled at Lys^{B29} of the insulin and the second oligomer is covalently coupled at N-terminal A1 or N-terminal B1 of the insulin.

80. (Canceled)

81. (Previously Presented) The mixture according to Claim 79, wherein the insulin is covalently coupled to at least one of the oligomers by a hydrolyzable bond.

82. (Previously Presented) The mixture according to Claim 79, wherein the insulin is covalently coupled to the polyethylene glycol moiety of at least one of the oligomers.

83. (Previously Presented) The mixture according to Claim 79, wherein at least one of the oligomers comprises a lipophilic moiety covalently coupled to the polyethylene glycol moiety.

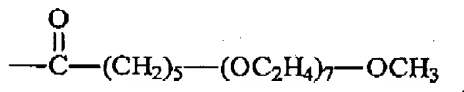
84. (Previously Presented) The mixture according to Claim 79, wherein at least one of the oligomers comprises a lipophilic moiety.

85. (Previously Presented) The mixture according to Claim 84, wherein the insulin is covalently coupled to the lipophilic moiety.

Attorney Docket No. 9233-54
Application Serial No.: 09/873,899
Filed: June 4, 2001
Page 6

86. (Previously Presented) The mixture according to Claim 84, wherein the polyethylene glycol moiety is covalently coupled to the lipophilic moiety.

87. (Currently Amended) A substantially monodispersed mixture of conjugates, each comprising an insulin drug coupled to an oligomer having a formula:



~~The mixture according to Claim 72,~~ wherein the conjugate comprises a first oligomer and a second oligomer.

88. (Previously Presented) The mixture according to Claim 79, wherein the first and the second oligomers are the same.

89. (Previously Presented) The mixture according to Claim 79, wherein the mixture is monodispersed.

90. (Previously Presented) The mixture according to Claim 79, wherein at least one of the oligomers comprises a first polyethylene glycol moiety covalently coupled to the insulin by a non-hydrolyzable bond and a second polyethylene glycol moiety covalently coupled to the first polyethylene glycol moiety by a hydrolyzable bond.

91. (Previously Presented) The mixture according to Claim 90, wherein the oligomer(s) comprising a first polyethylene glycol moiety covalently coupled to the insulin by a non-hydrolyzable bond and a second polyethylene glycol moiety covalently coupled to the first polyethylene glycol moiety by a hydrolyzable bond further comprise a lipophilic moiety covalently coupled to the second polyethylene glycol moiety.

92. (Previously Presented) The mixture according to Claim 79, wherein each of the conjugates is amphiphilically balanced such that each conjugate is aqueously soluble and able to penetrate biological membranes.

93-96. (Canceled)

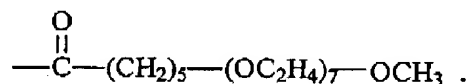
Attorney Docket No. 9233-54
Application Serial No.: 09/873,899
Filed: June 4, 2001
Page 7

97. (Previously Presented) The mixture according to claim 79, wherein at least one of the oligomers comprises a polyethylene glycol moiety having at least 2 polyethylene glycol subunits.

98. (Previously Presented) The mixture according to claim 79, wherein at least one of the oligomers comprises a polyethylene glycol moiety having at least 5 polyethylene glycol subunits.

99. (Previously Presented) The mixture according to claim 79, wherein at least one of the oligomers comprises a polyethylene glycol moiety having at least 7 polyethylene glycol subunits.

100. (Previously Presented) The mixture according to claim 79, wherein the first oligomer has the formula:



101-102. (Canceled)

103. (New) The mixture according to Claim 24, wherein the dispersity coefficient is greater than 100,000.

104. (New) The mixture according to Claim 24, wherein the dispersity coefficient is greater than 500,000.

105. (New) The mixture according to Claim 24, wherein the insulin drug is human insulin and the oligomer is covalently coupled to Lys^{B29} of the human insulin.

106. (New) The mixture according to Claim 24, wherein the mixture has an *in vivo* activity that is greater than the *in vivo* activity of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

Attorney Docket No. 9233-54
Application Serial No.: 09/873,899
Filed: June 4, 2001
Page 8

107. (New) The mixture according to Claim 24, wherein the mixture has an *in vitro* activity that is greater than the *in vitro* activity of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

108. (New) The mixture according to Claim 24, wherein the insulin-drug oligomer has an increased resistance to degradation by chymotrypsin when compared to the resistance to degradation by chymotrypsin of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

109. (New) The mixture according to Claim 24, wherein the mixture has an inter-subject variability that is less than the inter-subject variability of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

110. (New) The mixture according to Claim 87, wherein the mixture is monodispersed.

111. (New) The mixture according to Claim 87, wherein the insulin drug is human insulin and the oligomer is covalently coupled to Lys^{B29} of the human insulin.

112. (New) The mixture according to Claim 87, wherein the mixture has an *in vivo* activity that is greater than the *in vivo* activity of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

113. (New) The mixture according to Claim 87, wherein the mixture has an *in vitro* activity that is greater than the *in vitro* activity of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

114. (New) The mixture according to Claim 87, wherein the insulin-drug oligomer has an increased resistance to degradation by chymotrypsin when compared to the resistance to degradation by chymotrypsin of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

Attorney Docket No. 9233-54

Application Serial No.: 09/873,899

Filed: June 4, 2001

Page 9

115. (New) The mixture according to Claim 87, wherein the mixture has an inter-subject variability that is less than the inter-subject variability of a polydispersed mixture of insulin drug-oligomer conjugates having the same number average molecular weight as the mixture.

116. (New) The mixture according to Claim 87, wherein the insulin drug is covalently coupled to the oligomer.

117. (New) A composition comprising:
the mixture according to claim 16; and
a pharmaceutically acceptable carrier.

118. (New) A method of treating insulin deficiency in a subject in need of such treatment, said method comprising administering an effective amount of a mixture of conjugates according to claim 16.

119. (New) A composition comprising:
the mixture according to claim 24; and
a pharmaceutically acceptable carrier.

120. (New) A method of treating insulin deficiency in a subject in need of such treatment, said method comprising administering an effective amount of a mixture of conjugates according to claim 24.

121. (New) A composition comprising:
the mixture according to claim 87; and
a pharmaceutically acceptable carrier.

122. (New) A method of treating insulin deficiency in a subject in need of such treatment, said method comprising administering an effective amount of a substantially monodispersed mixture of conjugates according to claim 87.